REMARKS

By this response the specification has been amended to correct punctuation and the description of the FIGS. Reconsideration of the application is respectfully requested.

Objections to the Drawings

The drawings have been objected to because the drawing descriptions at paragraphs [0011] - [0013] are incorrect. The amendments to these paragraphs correct the description of the FIGS. and are believed to overcome the Examiner's objection.

Objection to the Specification

The amendment to paragraph [0021] comprises the addition of a period to the end of the paragraph, and overcomes the Examiner's objection.

Rejections under 35 USC §103(a)

Claims 1-13 have been rejected under 35 USC §103(a) as being unpatentable over Kaloyeros et al. (US 6,346,477) in view of AAPA, pages 2-3.

Kaloyeros, at column 7 line 31 through column 8 line 38 discloses the formation of a cobalt metal layer through a two-step atomic layer deposition (ALD) process. In a first step, a substrate is heated in a chamber and exposed to a cobalt source precursor. Next, a reactant gas such as hydrogen is introduced into the deposition chamber for a period sufficiently long to ensure reaction with the adsorbed precursor layer resulting in the formation of a first cobalt atomic layer on the substrate surface. This pulsing can continue until a film of a desired thickness is formed.

At column 2 lines 25-33 Kaloyeros discusses a prior process by Rhee et al. which uses cyclopentadienylcobalt dicarbonyl as a precursor in a chemical vapor deposition (CVD) process. The Rhee process first deposits a cobalt carbon layer (Co-C) onto a silicon substrate through CVD decomposition of cyclopentadienylcobalt dicarbonyl as a cobalt source, followed by an *ex situ* anneal to diffuse the cobalt from the cobalt carbon to react with the silicon substrate to form cobalt silicide.

Kaloyeros also discusses a CVD-based process for the preparation of conformal epitaxial cobalt disilicide starting at column 5 line 40.

The background of the present application, pages 2-3, teaches the benefits of forming various semiconductor device features from cobalt metal.

It is not evident that the CVD process and the ALD process discussed in Kaloyeros can be combined to result in the present atomic layer deposition process as claimed. For example, the CVD process decomposes cyclopentadienylcobalt dicarbonyl into a cobalt carbon layer on a silicon substrate, then anneals the layer to react the cobalt in the C-Co layer with the silicon substrate to form $CoSi_2$. The ALD process of Kaloyeros forms a cobalt precursor layer on the substrate, then introduces hydrogen to react with the adsorbed precursor layer resulting in the formation of a first cobalt atomic layer. It is not evident that the C-Co layer formed using CVD (column 2 lines 25-40) would form using ALD, or that carbon from the C-Co layer would react with environmental hydrogen to leave a cobalt metal layer.

Further, Kaloyeros discusses the CVD formation of a pure cobalt layer using CVD (column 5 line 40 - column 7 line 30), but omits the use of cyclopentadienylcobalt dicarbonyl as a precursor (see column 6 lines 5-20). Kaloyeros also omits the use of cyclopentadienylcobalt dicarbonyl for use with the ALD process (see claim 2, for example).

Thus while ALD and cyclopentadienylcobalt dicarbonyl are both discussed in Kaloyeros, cyclopentadienylcobalt dicarbonyl is discussed relative to a CVD process where cobalt metal does not appear to be either a final or intermediate product.

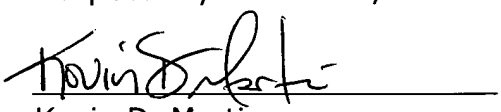
Thus it is submitted that claims 1-13 are allowable over Kaloyeros and AAPA under 35 USC §103(a).

Claim 10 is further allowable over the cited art, which fails to teach or suggest "...immersing the substrate assembly having the cobalt metal layer into a plating solution which uses the cobalt metal layer as a seed layer." Further, the plating solution of claim 11, nor heating the plating solution as discussed in claim 12, nor the pH of the plating solution as discussed in claim 13. Because the cited art does not teach or suggest all of the limitations discussed in the claims as required by MPEP §706.02(j), claims 10-13 are allowable over the cited art under 35 USC §103(a).

Conclusion

If the Examiner believes a conference will expedite prosecution of this case, the Examiner is cordially invited to call the undersigned. This is believed to be a complete and proper response to the Examiner's office action.

Respectfully submitted,



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